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C-47 conc'd

--66. An electronic apparatus comprising:

a display including a liquid crystal display device according to claim 61.--

--67. An electronic apparatus comprising:

a display including a liquid crystal display device according to claim 62.--

REMARKS

Claims 30, 31, 33-41 and 44-67 are pending. By this Amendment, claims 32, 42 and 43 are canceled, and claims 30, 31, 37 and 38 are amended and claims 49-67 are added. Claim 62 includes the recitations of original claims 30, 31 and 32.. No new matter has been added. Reconsideration in view of the above amendments and following remarks is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R. §1.121(b)(1)(iii)) and claim (37 C.F.R. §1.121(c)(1)(ii)).

The Examiner is requested to review the references submitted with the attached Information Disclosure Statement.

I. THE CLAIMS SATISFY ALL FORMAL REQUIREMENTS

The Office Action rejects claims 31 and 32 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. With respect to claim 32, this rejection is moot. Claim 31 has been amended to obviate this rejection.

THE CLAIMS CONTAIN ALLOWABLE SUBJECT MATTER

The Office Action rejects claims 30, 33 and 42 under 35 U.S.C. §102(e) as being anticipated by Ohgawara et al (U.S. Patent No. 5,365,357). The Office Action also rejects claims 37, 38 and 43 under 35 U.S.C. §103(a) as being unpatentable over Ohgawara. With respect to claims 32, 42 and 43, these rejections are moot. With respect to the remaining claims, these rejections are respectfully traversed.

A. Claims 30 and 37

Ohgawara does not teach or suggest:

(1) "a color filter arranged in the first section (of the dot area), wherein no color filters are arranged in the second section (of the dot area)", as recited in independent claim 30;

(2) "a color filter arranged in the first section; and a layer arranged in the second section, and being substantially transparent" as recited in independent claim 37;

(3) "a color filter positioned between the liquid crystal material and one of the first and the second electrode, wherein the color filter selectively arranged in the first section" as recited in new independent claim 56; or

(4) wherein the size of the color filter is smaller than that of dot area as recited in new independent claim 61.

Ohgawara discloses that color filters 23 in pixel portions that are arranged within display region 21, and color filters 27 or peripheral region 25 (see Fig. 3 of Ohgawara).

However, Ohgawara doesn't compare the sizes of color filter (23, 27) and the pixel portion. Ohgawara only discloses "color filters 27 have an area of 5-50% of color filters 23." That is, Ohgawara compares color filters 27 in the peripheral portion and color filters 23 in the display region. Ohgawara's color filters 27 may be equal to or larger than pixel areas, if each color filter 23 is larger than its respective pixel portion.

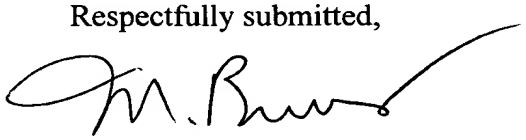
Furthermore, color filters 27 of Ohgawara never correspond to the color filters claimed. As claimed the color filter has to be "for display". Ohgawara's color filters 27 are in the peripheral region around the region for display. Ohgawara discloses "color filters 27 are similar to those in the pixel portions of the display region", at, e.g., col. 8, line 49. However, it is clear that the meaning of the word "similar" doesn't signify similarity of size, because color filters 27 have to be 5-50% of color filters 23. Further, Ohgawara doesn't describe a pixel portion corresponding to color filters 27, and only discloses these for color filters 23.

II. CONCLUSION

In view of the foregoing, Applicants submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number listed below.

Respectfully submitted,



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Attachment:
Appendix

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DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Specification:

Page 6, lines 21-32:

In order to solve the problems mentioned above, the present invention comprises a pair of substrates having electrodes on the opposing inner faces and having formed matrix-like dot groups, a liquid crystal sandwiched between said substrates, at least two colors of color filters, and at least one polarizing plate. By being configured in this manner, the reflective type liquid crystal device ~~as defined in Claim 1~~ has the advantages of having a higher contrast and being able to display colors more brilliantly compared with the conventional reflective type liquid crystal devices that use a liquid crystal mode not having a polarizing plate.

Page 12, lines 19-26:

Also, the invention is characterized by color filters being provided on the outer surface of the substrate on the side of the reflective plate of said pair of substrates. By being configured in this manner, it has the advantage of being able to be provided cheaply. Also, ~~particularly in combination with Claim 6,~~ it has the advantages of the assembly margin being expanded, and the visual angle being widened.

Page 14, lines 8-27:

Also, the invention is characterized by the product Δnxd of the multiple refraction Δn of the liquid crystals and the thickness d of the liquid crystal layer is from 0.34μm to 0.52μm. Most preferably, it is characterized by Δnxd being from 0.40μm to 0.52μm. Most preferably, it is characterized by Δnxd being 0.40μm. By being configured in this manner, the reflective type color liquid crystal device has the advantages of being brighter and having a wider visual angle. The conventional reflective type monochrome liquid crystal device used the second minimum condition whereby coloration is slight, that is, is used the condition

whereby Δnxd was 1.1μm-1.3μm. However, with a reflective type color liquid crystal device, there is no need to use the second minimum condition because slight coloration can be guaranteed by the color filters. Also, in the Specification of Japanese Laid-Open Patent No. 8-87009, page 5, lines 25-29, a condition of Δnxd = 0.55μm was used. ~~However, compared to Claim 19, this condition is darker, and moreover the coloration is great.~~

Page 27, lines 9-32:

Fig. 1 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device pertaining to <u>one exemplary embodiment of</u> the invention ~~as defined in Claim 1 of the present invention~~. First the configuration is explained. 101 is the upper polarizing plate, 102 is the opposing substrate, 103 is the liquid crystals, 104 is the element substrate, 105 is the lower polarizing plate, and 106 is the scattering reflective plate. On the opposing substrate 102 are provided the color filters 107 and the opposing electrodes (scanning wires) 108, and on the element substrate 104 are provided the signal wires 109, the pixel electrodes 110, and the MIM elements 111. Here, 101 and 102, 104 and 105, and 105 and 106 are drawn separated from each other, but this is in order to clarify the drawing, and in actuality they are adhered with glue. Also, the space between the opposing substrate 102 and the element substrate 104 is also drawn widely separated, but this is for the same reason, and in actuality there is only a gap of several μm to several tens of μm. Also, because Fig. 1 shows the essential components of a reflective type color liquid crystal device, only 3x3 = 9 dots are illustrated, but the present preferred embodiment has a higher number of dots than that, and it may have 480x640 = 307,200 dots or more.

Page 29, lines 20-34:

Fig. 3 is a drawing showing the spectral properties of the color filters of the reflective type color liquid crystal device pertaining to the invention ~~as defined in Claim 3 of the present~~ <u>one exemplary embodiment of the</u> invention. The configuration of Preferred

Embodiment 2 is similar to that of Preferred Embodiment 1 shown in Fig. 1, and color filters consisting of the two colors, red and cyan, still are provided. The horizontal axis of Fig. 2 is the light wavelength, the horizontal axis is the transmissivity, 301 shows the spectrum of the red filter, and 302 shows the spectrum of the cyan filter. Both colored color filters have transmissivities of 50% or more within the wavelength range of 450nm to 660nm. Also, the average transmissivity within the same wavelength range was 70% for the red filter and 78% for the cyan filter.

Page 30, lines 24-35:

Fig. 1 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device pertaining to ~~the invention as defined in Claim 2 of~~ one exemplary embodiment of the present invention. Also, Fig. 2 is a drawing showing the spectral properties of the color filters. Since the configuration of Preferred Embodiment 3 is fundamentally identical to the reflective type color liquid crystal device as defined in Preferred Embodiment 1, explanation of the various symbols is abridged. However, the Δnxd of the liquid crystals is set to 0.42μm. Also, the dot pitch was made 160μm horizontally and vertically, and the drive surface area ratio was made 75%.

Page 31, line 25 - page 32, line 2, delete current paragraph and insert therefore:

Fig. 5 is a drawing showing the spectral properties of the color filters of a reflective type color liquid crystal device pertaining to ~~the invention as defined in Claim 3 of~~ one exemplary embodiment of the present invention. The configuration of Preferred Embodiment 3 is identical to that of Preferred Embodiment 1 shown in Fig. 1, and color filters consisting of the two colors, red and cyan, still are provided. The horizontal axis of Fig. 5 is the light wavelength, the horizontal axis is the transmissivity, 501 shows the spectrum of the red filter, and 502 shows the spectrum of the cyan filter. Both colored color filters have transmissivities of 60% or more within the wavelength range of 450nm to 660nm. Also, the

average transmissivity within the same wavelength range was 75% for the red filter and 08% for the cyan filter.

Page 32, lines 23-34:

Fig. 6 is a drawing showing the essential elements of the structure of a reflective type color liquid crystal device pertaining to ~~the invention as defined in Claim 9~~ one exemplary embodiment of the present invention. First the configuration is explained. 601 is the upper polarizing plate, 602 is the opposing substrate, 603 is the liquid crystals, 604 is the element substrate, 605 is the lower polarizing plate, and 606 is the scattering reflective plate. On the opposing substrate 602 are provided the color filters 607 and the opposing electrodes (scanning wires) 608, and on the element substrate 604 are provided the signal wires 609, the pixel electrodes 610, and the MIM elements 611.

Page 33, line 29 - page 34, line 6:

Fig. 7 is a drawing showing the spectral properties of the color filters of the reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 3~~ according to one exemplary embodiment of the present invention. The configuration of Preferred Embodiment 2 is identical to Preferred Embodiment 5 shown in Fig. 6, but color filters consisting of the two colors, green and magenta, are provided in place of the red and cyan. The horizontal axis of Fig. 7 is the light wavelength, the vertical axis is the transmissivity, 701 shows the spectrum of the green filter, and 702 shows the spectrum of the magenta filter. The color filters of both colors have transmissivities at 50% or more in the 450nm to 660nm wavelength ranges. Also, the average transmissivity in the same wavelength ranges is 76% for the green filter and 78% for the magenta filter.

Page 34, lines 23-37:

Fig. 8 is a drawing showing the essential elements of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 3~~ according to one

exemplary embodiment of the present invention. First the configuration is explained. 801 is the upper polarizing plate, 802 is the opposing substrate, 803 is the liquid crystals, 804 is the element substrate, 805 is the lower polarizing plate, and 806 is the scattering reflective plate. On the opposing substrate 802 are provided the color filters 807 and the opposing electrodes (scanning wires) 808, and on the element substrate 804 are provided the signal wires 809, the pixel electrodes 810, and the MIM elements 811. On top of the upper polarizing plate is applied a weak antiglare processing for the purpose of suppressing glare of the illuminating light.

Page 35, line 28 - page 36, line 5:

Fig. 10 is a drawing showing the essential elements of the structure of a reflective type liquid crystal device ~~pertaining to the invention as defined in Claim 4~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 1001 is the upper polarizing plate, 1002 is the element substrate, 1003 is the liquid crystals, 1004 is the opposing substrate, 1005 is the lower polarizing plate, and 1006 is the scattering reflective plate. On the opposing substrate 1004 are provided the opposing electrodes (scanning wires) 1011 and the color filters 1010, and on the element substrate 1002 are provided the signal wires 1007, the MIM elements 1008, and the pixel electrodes 1009. The color filters 1010 are the dye scattering type, and they consist of the three colors, red ("R" in the drawing), green ("C" in the drawing), and blue ("B" in the drawing).

Page 37, lines 2-23:

Fig. 12 is a drawing showing the spectral properties of the color filters of a reflective type color liquid crystal device ~~as defined in Claim 3, Claim 4 or Claim 5~~ according to one exemplary embodiment of the present invention. The configuration of Preferred Embodiment 9 is similar to the case of Preferred Embodiment 7 shown in Fig. 8, and color

filters consisting of the three colors, red, green, and blue, are still provided. The horizontal axis of Fig. 12 is the light wavelength, the vertical axis is the transmissivity, 1201 shows the spectrum of the red filter, 1202 shows the spectrum of the green filter, and 1203 shows the spectrum of the blue filter. Here, only the green filter has a transmissivity of 50% or more within the wavelength range of 450nm to 660nm. Also, the lowest transmissivity of the red filter for the light of the wavelengths in the range of 450nm to 660nm is clearly lower in comparison with the blue filter and the green filter. By having such a red filter, it is possible to display brilliantly the red that appeals most to the human eyes. Also, in the aim of compensate for the deepening of the red, the spectrum 1203 of the blue filter was made nearer to cyan. Therefore, bright colors having little coloration could be displayed.

Page 38, lines 1-16:

Fig. 10 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 3~~ according to one exemplary embodiment of the present invention. The configuration is explained. 1001 is the upper polarizing plate, 1002 is the element substrate, 1003 is the liquid crystals, 1004 is the opposing substrate, 1005 is the lower polarizing plate, and 1006 is the scattering reflective plate. On the opposing plate 1004 are provided the opposing electrodes (scanning wires) 1011 and the color filters 1010, and on the element substrate 1002 are provided the signal wires 1007, the MIM elements 1008, and the pixel electrodes 1009. The color filters 1010 are the dye scattering type, and they consist of the three colors, red ("R" in the drawing), green ("C" in the drawing), and blue ("B" in the drawing).

Page 39, line 28 - page 40, line 8:

Fig. 15 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 6~~ according to one exemplary embodiment of the present invention. First the configuration is explained.

1501 is the upper polarizing plate, 1502 is the element substrate, 1503 is the liquid crystals, 1504 is the opposing substrate, 1505 is the lower polarizing plate, and 1506 is the scattering reflective plate. On the opposing plate 1504 are provided the opposing electrodes (scanning wires) 1511 and the color filters 1510, and on the element substrate 1502 are provided the signal wires 1507, the MIM elements 1508, and the pixel electrodes 1509. The light-variable area in one dot is an area in which a bump-shaped ITO on the element substrate overlaps with a bar-shaped ITO on the opposing substrate, and that outline is shown with a broken line on the ITO of the opposing substrate. (Although a part is overlaid by the color filters, please refer to Fig. 20, which shows the same outline.)

Page 42, lines 10-15:

Preferred Embodiment 12 also is a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 6~~ according to one exemplary embodiment of the present invention. Its structure is the same as the reflective type color liquid crystal device of Preferred Embodiment 11 shown in Fig. 15, but the properties of the color filters are different.

Page 43, line 29 - page 44, line 7:

Fig. 20 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 6~~ according to one exemplary embodiment of the present invention. The configuration is explained. 2001 is the upper polarizing plate, 2002 is the element substrate, 2003 is the liquid crystals, 2004 is the opposing substrate, 2005 is the lower polarizing plate, and 2006 is the scattering reflective plate. On the opposing plate 2004 are provided the opposing electrodes (scanning wires) 2011 and the color filters 2010, and on the element substrate 2002 are provided the signal wires 2007, the MIM elements 2008, and the pixel electrodes 2009. Also, the light-variable area in one dot is an area in which a bump-shaped ITO on the element substrate overlaps with

a bar-shaped ITO on the opposing substrate, and that outline is shown with a broken line on the ITO of the opposing substrate.

Page 44, lines 25-37:

Fig. 21 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 6~~ according to one exemplary embodiment of the present invention. The configuration is explained. 2101 is the upper polarizing plate, 2102 is the element substrate, 2103 is the liquid crystals, 2104 is the opposing substrate, 2105 is the lower polarizing plate, and 2106 is the scattering reflective plate. On the opposing plate 2104 are provided the opposing electrodes (scanning wires) 2112 and the color filters 2111, and on the element substrate 2102 are provided the signal wires 2107, the MIM elements 2108, and the pixel electrodes 2109.

Page 45, line 22 - page 46, line 27:

Preferred Embodiment 5 is a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 6~~ according to one exemplary embodiment of the present invention. However, its structure is identical to the reflective type color liquid crystal device of Preferred Embodiment 12 shown in Fig. 15, the reflective type color liquid crystal device of Preferred Embodiment 13 shown in Fig. 20, and the reflective type color liquid crystal device of Preferred Embodiment 14 shown in Fig. 21.

Its characteristics is in the point that the color filters are provided in the positions between the electrodes and the liquid crystals. Generally, color filters are provided in the positions between the electrodes and the substrate in order to ~~print~~ apply the voltage effectively on the liquid crystals. However, by arranging them in the manner of the present preferred embodiment, two new effects are obtained. One is the expansion of the visual angle; and another is the improvement of the color purity in the intermediate tones.

Fig. 22 is a drawing showing the voltage reflectivity properties of the reflective type color liquid crystal device in Preferred Embodiment 15 of the present invention. The horizontal axis is the voltage effectively ~~printed~~ applied to the liquid crystals, and the vertical axis is the reference reflectivity set to 100% when the voltage is not ~~printed~~ applied. 2201 is the properties of the areas not having color filters within the light variable areas, and 2202 is the properties of the areas having the color filters. Because of the voltage effect due to the division of capacity, the sharpness of 2202 is worse in the voltage reflectivity properties than 2201. In other words, it is harder for the voltage to be ~~printed on~~ applied to the liquid crystals when the areas having the color filters are compared with the areas not having them. Because two areas exist within a single pixel, having different voltage-spending conditions in this manner, the visual angle properties are improved by the effect (generally called the "halftone effect") disclosed in the publication of Japanese Laid-Open Patent No. 2-12 and the publication of Japanese Laid-Open Patent No. 4-348323. Also, because the areas having the color filters always have a higher reflectivity in the intermediate tone display state, there is also the effect of the colors being displayed richer.

Page 46, line 29 - page 47, line 2:

Fig. 23 is a drawing showing the structure of the color filter substrate of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 7~~ according to one exemplary embodiment of the present invention. (a) is a frontal view, and (b) is a cross section. First, the configuration is explained. The rectangular area 2304 surrounded by the broken line of (a) shows one dot. 2309 is the glass substrate, 2301 is the red filter, 2303 is the green filter, 2302 is the blue filter, 2305 is the gap between dots, the hatched area 2308. is acryl, 2307 is a protective film, and 2306 is a transparent ITO electrode.

Page 49, lines 11-20:

Fig. 28 is a drawing showing the structure of the color filters of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 7~~ according to one exemplary embodiment of the present invention. (a) is a frontal view, and (b) is a cross section. First, the configuration is explained. The rectangular area 2804 surrounded by the broken line of (a) shows one dot. 2808 is the glass substrate, 2807 is the ITO electrode, 2801 is the red color filter, 2803 is the green color filter, 2802 is the blue color filter, and the hatched area 2806 is acryl.

Page 52, lines 13-25:

Fig. 33 is a drawing showing the essential components of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 8~~ according to one exemplary embodiment of the present invention. The configuration is explained. 3301 is the upper polarizing plate, 3302 is the element substrate, 3303 is the liquid crystals, 3304 is the opposing substrate, 3305 is the lower polarizing plate, and 3306 is the scattering reflective plate. On the opposing substrate 3304 are provided the opposing electrodes (scanning wires) 3311 and the color filters 3310, and on the element substrate 3302 are provided the signal wires 3307, the MIM elements 3308, and the pixel electrodes 3309.

Page 54, lines 15-38:

Fig. 37 is a drawing showing an outline of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 10~~ according to one exemplary embodiment of the present invention. The configuration is explained. 3701 is a frame case, 3702 is the upper polarizing plate, 3703 is the upper substrate, the hatched area of 3704 is the color filters, 3705 is the lower substrate, and 3706 is the polarizing plate with the reflecting plate attached. Because the figure is complicated, the transparent electrodes, nonlinear elements, signal wires, orientation film, and the like, have been omitted. Also, 3711 is the drive display area, 3712 is the effective display area, and 3713 is the area having

the color filters. (b) is a horizontal cross section, but the vertical cross section is identical to (b). The terms "drive display area" and "effective display area" are defined in the Electronic Industry Association of Japan (EIAJ) standard ED-2511A as "the area possessing the display function in a liquid crystal display device" and "the effective area as the drive display area and the screens following that," respectively. That is, the drive display area is the area capable of expending voltage in the liquid crystals, and the effective display area is all the area of the liquid crystal panel not hidden by the frame case.

Page 55, line 22 - page 56, line 18:

In a transmissive type color liquid crystal device, generally a black mask is provided outside the dots, but if a black mask is provided in a reflective type color liquid crystal device, while a high contrast is obtainable, on the contrary, the display becomes extremely dark. Particularly in liquid crystal modes in which the parallax is unavoidable, such as the TN mode and the STN mode, because the light is absorbed two times by the black mask when introduced and when emitted, the brightness has a quality substantially proportional to the square of the aperture. Consequently, a black mask cannot be provided in a reflective type color liquid crystal device, but conversely, if no light-absorbing body is provided whatsoever outside the dots, the contrast decreases markedly, being undesirable. Thus, in one exemplary embodiment of ~~the invention as defined in Claim 11 of the present invention does not provide~~ the invention a black mask is not provided outside the dots, rather it comprises color filters having the same extent or less absorption as the areas inside the dots.

Fig. 38 is a drawing showing the placement of the color filters of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 11~~ according to one exemplary embodiment of the present invention. The fundamental configuration and spectral properties of the color filters are identical to Fig. 6 of Preferred Embodiment 5, but pains were taken in the placement of the color filters in the area outside the dots. In Fig. 38, the

"horizontally protruding" area shown in 3801 corresponds to the dots in ~~Claim 11~~, being the area in which the opposing electrodes and pixel electrodes are overlaid and the electric field is imprinted in the liquid crystals. Also, the area 3802 having applied hatching slanted from the top right to the bottom left is the cyan filters, and the area 3803 having applied cross hatching is the red filters.

Page 56, line 32 - page 57, line 11:

Fig. 39 is a drawing showing the placement of the color filters of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 11~~ according to one exemplary embodiment of the present invention. The fundamental configuration and spectral properties of the color filters are identical to Fig. 8 of Preferred Embodiment 9 and Fig. 12, but pains were taken in the placement of the color filters outside the dots. In Fig. 39, the "horizontally protruding" area shown in 3901 corresponds to the dots ~~in Claim 11~~, being the area in which the opposing electrodes and the pixel electrodes are overlaid and the electric field is imprinted in the liquid crystals. Also, the area 3902 having applied hatching slanted from the top left to the bottom right is the blue filters, the area 3903 having applied hatching slanted from the top right to the bottom left is the green filters, and the area 3904 having applied cross hatching is the red filters.

Page 58, lines 5-17:

Fig. 41 is a drawing showing the placement of the color filters of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 11~~ according to one exemplary embodiment of the present invention. In Fig. 41, the "horizontally protruding" area shown in 4101 corresponds to the dots in Claim 11, being the area in which the opposing electrodes and the pixel electrodes are overlaid and the electric field is imprinted in the liquid crystals. Also, the area 4102 having applied hatching slanted from the top left to the bottom right is the blue filters, the area 4103 having applied hatching slanted from the top right to the

bottom left is the .green filters, and the area 4104 having applied cross hatching is the red filters.

Page 58, line 31 - page 59, line 9:

Fig. 42 is a drawing showing the essential elements of the structure of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 12~~ according to one exemplary embodiment of the present invention. The configuration is explained. 4201 is the upper polarizing plate, 4202 is the element substrate, 4203 is the liquid crystals, 4204 is the opposing substrate, 4205 is the lower polarizing plate, and 4206 is the scattering reflective plate. On the element substrate 4202 are provided the signal wires 4207 and the pixel electrodes 4208, and on the opposing substrate are provided the opposing electrodes (scanning wires) 4209. They do not appear on this cross section, but the signal wires and the pixel electrodes are connected via MIM elements. Also, on the surface of the reflective plate side of the opposing substrate are provided the red filters 4210, the green filters 4211, and the blue filters 4212.

Page 59, line 23 - page 60, line 4:

Preferred Embodiment 27 is reflective type color liquid crystal device ~~pertaining to Claim 13~~ according to one exemplary embodiment of the present invention. Its structure is identical to Fig. 1 of Preferred Embodiment 1, Fig. 6 of Preferred Embodiment 6, and Fig. 8 of Preferred Embodiment 7. Its characteristics are in the fact that on the substrate 104, 604, 804. positioned on the side of the reflective plate are provided the MIM elements 111, 611, 811. By being positioned in this manner, compared with the case of the reverse configuration, that is, having provided the MIM elements on the substrate 102, 602, 802, unwanted surface reflection is reduced, and a high contrast was obtained. There are three reasons for this. One is that the reflections by the signal wires 109, 609, 809 and the MIM elements are partially absorbed by the color filters 107, 607, 807. The second is that the

signal wires themselves are of a structure having superimposed metallic Ta and metallic Cr. The third is that the reflected light incurs absorption due to the interference of multiple refraction by passing through the liquid crystal layer 103, 603, 803.

Page 60, lines 6-11:

Preferred Embodiment 28 is a reflective type color liquid crystal device ~~pertaining to Claim 14~~ according to one exemplary embodiment of the present invention. Its overall structure is identical to, for example, Fig. 8 of Preferred Embodiment 7. It characteristics are in the wiring method of the MIM elements.

Page 61, lines 14-32:

Fig. 45 shows the properties of a reflective type color liquid crystal device ~~pertaining to Claim 15~~ according to one exemplary embodiment of the present invention. Taking the same configuration as Preferred Embodiment 2, the relationships between the drive surface area ratio and contrast, and the drive surface area ratio and reflectivity when having changed the drive surface area ratio from 50% to 100% are shown. Here, drive surface area ratio is defined as the percentage occupied by the area driven by the liquid crystals within the areas excluding the non-transparent portions of the pixels, such as the metallic wiring, the MIM elements, and the like. The horizontal axis takes the drive surface area ratio, the vertical axis takes the contrast and reflectivity, 4501 is the contrast of the present preferred embodiment, 4502 is the contrast of a comparative example, 4503 is the reflectivity during cyan display of the present preferred embodiment, and 4504 is the reflectivity during cyan display of the comparative example.

Page 62, lines 12-27:

Fig. 46 and Fig. 47 are drawings showing the properties of the reflective type color liquid crystal devices ~~pertaining to the invention as defined in Claim 16~~ according to one exemplary embodiment of the present invention. In Fig. 46, 4604 is the scattering reflective

plate, 4601 is the light introduced at a 45° angle onto the surface of the scattering reflective plate, 4602 is the light of the positive reflection, and 4603 is a 30° cone centering the positive reflection. Also, the horizontal axis of Fig. 47 is the light-receiving angle of the reflected light, and the vertical axis is the relative reflective strength. The reflective plate of Preferred Embodiment 30 has the property that about 95% introduced light is reflected into the 30° cone. If this does not meet 80%, a contrast ratio of 1:10 cannot be obtained in an ordinary room environment.

Page 63, lines 9-23:

Fig. 49 is a drawing showing the essential components of the structure of a reflective type liquid crystal device ~~pertaining to the invention as defined in Claim 17~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 4901 is the upper polarizing plate, 4902 is the opposing plate, 4903 is the liquid crystals, 4904 is the element substrate, 4905 is the lower polarizing plate, 4906 is a semi-transmissive reflective plate, and 4912 is backlights. On the opposing plate 4902 are provided the color filters 4907 and the opposing electrodes (scanning wires) 4908, and on the element substrate 4904 are provided the signal wires 4909, the pixel electrodes 4910, and the MIM elements 4911. Also, the color filter has the identical spectral properties as Fig. 3 of Preferred Embodiment 2.

Page 64, lines 10-17:

Preferred Embodiment 32 relates to a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 18~~ according to an exemplary embodiment of the present invention, but the fundamental configuration and spectral properties of the color filters are identical to Fig. 6 of Preferred Embodiment 5 and Fig. 3. Its characteristic is in that the cell conditions of the TN mode are optimized in the reflective type color liquid crystal device.

Page 65, lines 20-25:

Preferred Embodiment 33 relates to a reflective type liquid crystal device ~~pertaining to the invention as defined in Claim 19~~ according to one exemplary embodiment of the present invention. Its characteristic is in that the cell conditions of the TN mode are further optimized in the reflective type color liquid crystal device.

Page 67, lines 23-38:

Fig. 52 is a drawing showing the essential components of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 20~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 5201 is the upper polarizing plate, 5202 is phase variation film, 5203 is the upper substrate, 5204 is the liquid crystals, 5205 is the lower substrate, 5206 is the lower polarizing plate, and 5207 is the scattering reflective plate. On the upper substrate 5203 are provided the color filters 5208 and the scanning electrodes 5209, and on the lower substrate are provided the signal electrodes 5210. The phase variation film 5202 is a single-axis extended polycarbonate film, and it shows a positive phase variation. Also the color filters have the identical spectral properties as Fig. 3 of Preferred Embodiment 2.

Page 69, lines 9-24:

Fig. 55 is a drawing showing the essential components of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 20~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 5501 is the upper polarizing plate, 5502 is the phase variation film, 5503 is the upper substrate, 5504 is the liquid crystals, 5505 is the lower substrate, 5506 is the .lower polarizing plate, and 5507 is the scattering reflective plate. On the upper substrate 5503 are provided the color filters 5508 and the scanning electrodes 5509, and on the lower substrate 5505 are provided the signal electrodes 5510. The phase variation film 5502 is a single-axis extended polycarbonate film,

and it has a phase variation of positive 587nm. The product Δnxd of the Δn of the liquid crystals and the cell gap is 0.85μm.

Page 71, lines 10-26:

Fig. 56 is a drawing showing the essential elements of a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 21~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 5601 is the upper polarizing plate, 5602 is the opposing substrate, 5603 is the liquid crystals, and 5604 is the element substrate. On the opposing substrate 5602 are provided the color filters 5605 and the opposing electrodes (scanning wires) 5606, and on the element substrate are provided the signal wires 5607, the, pixel electrodes combined with the scattering reflective plate 5608, and the MIM elements 5609. The pixel electrodes combined with the scattering reflective plate used had irregularities applied mechanically and chemically to the surface of a metal aluminum sputtered film. Also, the color filters have the identical spectral properties as Fig. 3 of Preferred Embodiment 2.

Page 72, line 28 - page 73, line 14:

The above preferred embodiments used MIM elements, but TFT elements also may be used in place of them. Fig. 58 is a drawing showing the essential elements of the structure when having created, using TFT elements, a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 21~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 5801 is the upper polarizing plate, 5802 is the opposing substrate, 5803 is the liquid crystals, and 5804 is the element substrate. on the opposing substrate 5802 are provided the color filters 5805 and the opposing electrodes (common electrodes) 5806, and on the element substrate 5804 are provided gate signal wires 5807, source signal wires 5808, the TFT elements 5809, and the pixel electrodes combined with the scattering reflective plate 5810. In the case of MIM elements, metallic

wiring only ran in the up and down directions, but with TFT elements, because the metallic wiring runs up and down as well as left and right, the aperture decreases. Fortunately, in this Preferred Embodiment 37 there is no need for a lower polarizing plate. Thus, when using TFT elements, it is desirable to provide an insulating film on the element and signal wire layers, on top of that to provide a new a reflective plate combined with pixel electrodes, and to take a method to connect the two via a contact hole.

Page 73, lines 16-22:

Preferred Embodiment 37 .relates to a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 22~~ according to one exemplary embodiment of the present invention, but first will be introduced six examples of reflective type monochrome liquid crystal devices. Any of these can be used as a reflective type color liquid crystal device by adding color filters.

Page 79, line 32 - page 80, line 9:

Fig. 69 is a drawing showing the essential components of a reflective type (color liquid crystal display ~~pertaining to the invention as defined in Claim 22~~ according to one exemplary embodiment of the present invention. 6901 is the scattering plate, 6902 is the upper polarizing plate, 6903 is the phase variation plate, 6904 is the upper substrate, 6905 is the liquid crystals, 6906 is the lower substrate, 6907 is the opposing electrodes (scanning wires), 6908 is the signal wires, 6909 is the pixel electrodes and mirror reflective plate, 6910 is the MIM elements, and 6911 is the color filters. The intervals between pixel and pixel were perpendicular to the signal wires and were 160μm in both parallel directions, the width of the signal wires was 10μm, the gaps between the signal wires and the pixel electrodes were 10μm, and the intervals between adjacent pixel electrode and pixel electrode were 10μm.

Page 81, lines 8-14:

Preferred Embodiment 38 relates to a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 23~~ according to one exemplary embodiment of the present invention, but first will be introduced two examples of reflective type monochrome liquid crystal devices. Either of these can be used as a reflective type color liquid crystal device by adding color filters.

Page 84, line 26 - page 85, line 14:

Preferred Embodiment 39 relates to a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 24~~ according to one exemplary embodiment of the present invention, but first will be introduced an example of a reflective type monochrome liquid crystal device. This can be used as a reflective type color liquid crystal device by adding color filters.

Fig. 59 is a cross section drawing of reflective type liquid crystal devices No. 1 and No. 2 ~~pertaining to the invention as defined in Claim 24~~ according to one exemplary embodiment of the present invention. First the configuration is explained. 5901 is the scattering plate, 5902 is the upper polarizing plate, 5903 is the upper substrate, 5904 is the upper electrodes, 5905 is the liquid crystals, 5906 is the lower electrodes, 5907 is the lower substrate, 5908 is the lower polarizing plate, and 5909 is the mirror reflective plate. The liquid crystals 5905 are twisted 90 degrees in the cells, and are TN mode, whereby No. 1 has the absorption axes of the polarizing plates 5902 and 5908 coincide with the lag phase axes of the liquid crystals 5905 of the adjacent boundaries, and No. 2 has the absorption axis of the polarizing plate 5902 and the absorption axis of the polarizing plate 5908 coincide with the lag phase axes of the liquid crystals 5905 of the respectively adjacent boundaries. The product Δnxd of the thickness d of the liquid crystals 5905 and the multiple refractivity Δn is 0.48μm.

Page 85, lines 18-25:

Fig. 73 is a drawing showing the voltage transmissivity properties of a reflective type liquid crystal device according to one exemplary embodiment ~~pertaining to the invention as defined in Claim 24~~ of the present invention. Here, 7301 is the manner of the change of transmissivity in relation to voltage of No. 1, and 7302 is the manner of the change of transmissivity in relation to voltage of No. 2. No. 1 is normally white, and No. 2 is a normally black display.

Page 86, lines 26-38:

Preferred Embodiment 40 is a reflective type color liquid crystal device ~~pertaining to the invention as defined in Claim 25,~~ according to one exemplary embodiment of the invention and is characterized by one pixel being composed of one dot. A pixel is the minimum unit capable of realizing the function necessary for display, and in the usual color liquid crystal device, one pixel is composed of a total of three dots, each dot being red, green, or blue. Consequently, in order to perform a 480x640 VGA display, 480x640x3 dots was necessary. When using two colors of color filters, being cyan and red, 480x640x2 dots was necessary. However, Preferred Embodiment 40 can perform VGA display with 480x640 pixels in a color liquid crystal device.

Page 87, line 33 - page 88, line 31:

Fig. 75 is a drawing showing one example of an electronic apparatus ~~pertaining to the invention as defined in Claim 26~~ according to one exemplary embodiment of the invention. This is a so-called PDA (Personal Digital Assistant), and it is a type of portable information terminal. 7501 is the reflective type color liquid crystal device, and on its front is attached a tablet for pen input. For the PDA display, a conventional reflective type monochrome liquid crystal device or a transmissive type color liquid crystal device was used. By exchanging these with a reflective type color liquid crystal device, it has the merit that the amount of

information by color display increases by leaps compared with the former. Also, it has the merits of extension of battery life and miniaturization.

Fig. 76. is a drawing showing an example of an electronic apparatus ~~pertaining to the invention as defined in Claim 27~~ according to one exemplary embodiment of the invention. This is a so-called digital still camera. 7601 is the reflective type color liquid crystal device, and it is installed such that its angle can be changed in relation to the body. Also, not illustrated, there is a lens inside this reflective type color liquid crystal device attachment. For the display of a digital still camera, a conventional transmissive type color liquid crystal device was used. By replacing this with a reflective type color liquid crystal device, not to mention the extension of battery life and miniaturization, the visual recognition under direct sunlight was improved dramatically. The reason is that, because a transmissive type color liquid crystal device is limited in the brightness of the backlights, it becomes hard to see when the surface reflection under direct sunlight becomes greater, but for a reflective type color liquid crystal device, the display also becomes brighter as the ambient light becomes brighter. Also because this ambient light is used efficiently, it is effective to be installed such that the angle of the liquid crystal device can be changed.

Changes to Claims:

Claims 32, 42 and 43 are canceled.

Claims 30, 31, 37 and 38 are amended.

30. (Amended) A liquid crystal ~~display~~ device comprising:

a first electrode;

a second electrode opposing the first electrode;

a dot area, formed at an overlapping portion of the first electrode and second electrode, for display,

the dot area including a first section and a second section;

a reflector arranged behind the dot area; and

a color filter arranged ~~to correspond to~~ in the first section, ~~of the dot area.~~

wherein no color filters are arranged in the second section.

31. (Amended) ~~The~~ A liquid crystal display according to claim 30, ~~the first section comprising about 45% or less of the dot area.~~

the dot area including a light-variable area, in which the color filter is arranged, for modulating light,

wherein the color filter occupies 15% or more and 45% or less of the light-variable area.

37. (Amended) A liquid crystal ~~display,~~device comprising:

a first electrode;

a second electrode opposing the first electrode;

a dot area, formed at an overlapping portion of the first electrode and second electrode, for display, wherein the dot area ~~having~~ includes a first section and a second section;

a reflector arranged behind the dot area;

a color filter arranged ~~to correspond to~~ in the first section ~~of the dot area~~; and

a ~~substantially transparent~~ layer arranged ~~to correspond to~~ in the second section, ~~of the dot area~~ and being substantially transparent.

38. (Amended) ~~The liquid crystal display according to 37, the color filter having a thickness substantially equal to a thickness of the layer.~~ A liquid crystal device according to claim 30, the thickness of the color filter and the layer is different, wherein the difference of level is 0.5μm or less.